US Army Corps of Engineers

DCAF Bulletin

Design Construction Analysis Feedback

No. 98-5 **Issuing Office:** CEMP-EC **Issue Date:** 6/8/98 **Exp. Date:** 31 DEC 2000

CEMP-EC

Subject: Installation and Federal Regulations for Underground Fuel Storage Tanks

Applicability: Information

1. Federal Regulations for Underground Storage Tanks (UST's) require all existing and new UST's to have leak detection. State and local regulations may be more stringent than Federal requirements, so you should always check to see which requirements you need to meet. By 22 December 1998 all UST's must also have spill, overfill and corrosion protection. The following tanks are not covered by these regulations:

a. Farm and residential tanks of 1,100 gallons or less capacity holding motor fuel used for noncommercial purposes.

b. Tanks storing heating oil used on the premises where it is stored.

c. Tanks on or above the floor of underground areas, such as basements or tunnels.

d. Septic tanks and systems for collecting storm water and wastewater.

e. Flow-through process tanks.

f. Emergency spill and overfill tanks.

g. Other storage sites, such as surface impoundments, are not covered by the federal requirements.

h. Some tanks, such as field-constructed tanks, have been deferred from most of the regulations. For details see 40 CFR part 280.

2. CEGS 13202, Fuel Storage Systems, covers the requirements for UST's. Tanks shall be double wall type with full 360 degrees circumference steel or fiberglass reinforced plastic (FRP) outer wall. The following requirements for steel and FRP tanks are from CEGS 13202 and are typically found in construction contracts. Confirm your contract specifications have the same requirements with enforcement through the 3 phase inspection process.

a. Double Wall Steel UST.

(1) Meet UL 58, type II, NFPA 30 or 30A.

(2) UL label on exterior of tank. Designed for horizontal use.

(3) Interior and exterior of tank wall shall be separated by interstitial space.

(4) Monitor interstitial for leak detection. See Figure 1.

(5) Tanks with anchor pads for ballast shall have hold-down straps. See Figures 2 & 3.

(6) Filler strips shall be used between tank shell and metal straps. See Figure 3.

(7) Continuous fillet weld tank shell lap joints interior and exterior surfaces.

(8) Steel tank exterior protective coating options.

a. FRP coated tanks per UL 1746 do not require additional cathodic protection.

b. STI-P3 corrosion protection system cathodic protection is based on 5 percent of steel tank surface. See figure 4.

(9) Interior protective coating for steel tanks.

a. Per API RP 1631 from tank bottom up tank side 3 feet.

b. Entire tank interior coated per CEGS 09873.

b. Double wall FRP Tank.

(1) Per ASTM D 4021, UL 1316, NFPA 30 or 30A.

(2) Standoffs required between interior and exterior walls of tank to create an interstitial.

(3) Designed for below ground horizontal installation.

(4) UL labeled.

(5) Hold down straps required with anchor pads. See figure 2 & 3.

(6) All accessories shall be corrosion resistant. See figure 2.

(7) Entire interstitial space shall be monitorable. See figure 1.

(8) Concrete anchor pads shall be constructed as indicated.

c. Requirements for all UST's.

(1) Tank manway shall be provided with cover and tank ladder.

(2) Interior ladder shall be fiberglass or steel.

(3) Manway containment sump watertight connection to tank exterior.

(4) Piping penetrations of sump shall be booted to be watertight.

(5) Sump access cover shall be watertight.

(6) Tank striker plate, 1/4 inch thick, under each manway or pipe connection.

(7) Tank atmospheric vent not less than 1 1/4 inches inside diameter.

(8) Tank overfill prevention valve float operated only for gravity fill.

(9) Tank overfill alarm system, including float gauge and alarm panel.

(10) Two stick gauges and fill charts are required for all tanks.

(11) Analog, hydrostatic and digital gauge systems are optional.

(12) Tight-fit bronze adapter with Buna-N or viton gasket.

(13) Tight-fit vapor recovery adapter if required.

(14) Below ground individual spill container for adapters.

3. Installation of UST's shall be in accordance with the following CEGS 13202 requirements.

a. Handle with extreme care during unloading, storage and installation. See figures 13 & 14.

b. Install per manufacturer's installation requirements, and NFPA 30 or 30A.

c. NFPA 30 references Petroleum Equipment Institute (PEI) RP 100-94. PEI RP 100-94 requirements are summarized below.

(1) Test and inspect tank before installation. See figures 6, 7, 8, 9 & 10.

(2) Areas not subject to traffic.

a. Cover tank with minimum 2 feet of earth. In unpaved area not subject to traffic. See figure 11.

b. Or one foot of earth with 4 inches of reinforced concrete slab over tank. See figure 11.

(3) Areas subject to traffic.

(a) 30 inches of compacted backfill and 6 inches of asphaltic concrete. See figure 12.

(b) Or 18 inches of well tamped earth plus 8 inches of reinforced concrete. See figure 12.

(c) Paving over tank shall extend at least one foot beyond tank.

(4) Depth of cover not greater than the tank diameter, or contact manufacturer.

(5) Maximum recommended burial depth for FRP tanks is 7 feet to top of tank.

(6) Static head on bottom of atmospheric tank shall not exceed 10 psig if vent or fill pipe is full of liquid.

d. Inspect exterior surface of each tank for damage. See figure 6.

e. Repair exterior surface per manufacturer's recommendations. See figure 7.

f. Slope tank 1/8 inch per foot. Fill point at low end and vent connection at high end.

g. Discharge pipes slope up from tank to fuel outlet.

h. Containment sumps installed before backfilling.

i. Store, handle and place tank in a manner to minimize damage. See figures 13 & 14.

j. Set tank on minimum of 6 inches of backfill without anchor pad. See figure 5.

k. Install anchor pad as indicated on drawings. See figures 2 & 3.

l. 12 inches of backfill between anchor pad and tank. See figure 3.

m. Metal anchor straps and accessories shall be coated. See figure 2.

n. Holiday test steel tank protective coating prior to backfill.

o. Inspect anodes during backfill operations. See figure 4.

p. Place backfill uniformly around tank and extend to grade level. See figures 15 & 16.

q. FRP tanks handle with care, inspect for damage before installation. See figure 6.

r. Repair FRP tank damage directly under manufacturer's supervision.

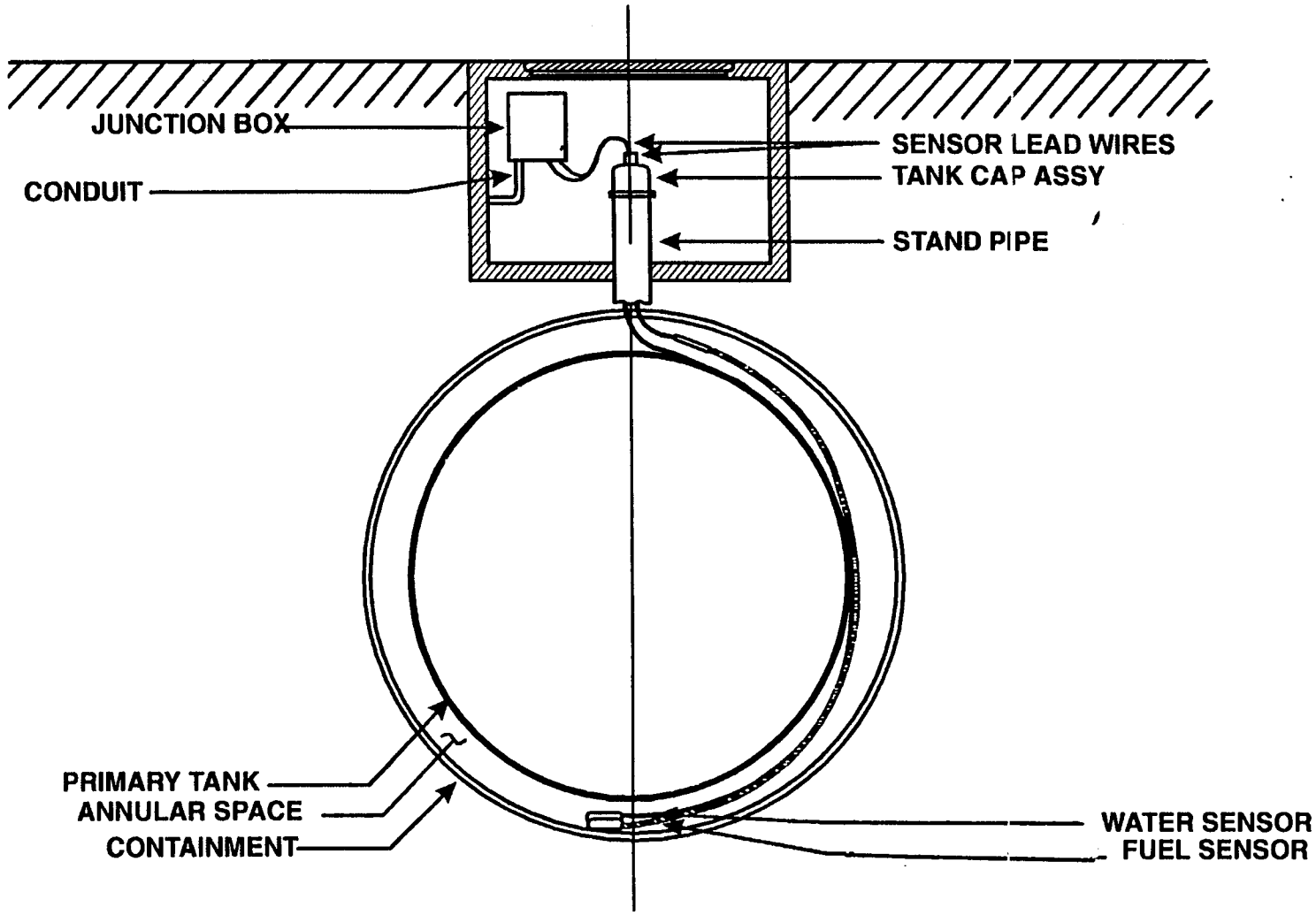
s. FRP tanks installation per j, k and l above.

4. Make sure your UST is installed correctly by using qualified installers who follow industry codes. Certify on a notification form that you have used a qualified installer who can assure that the UST has been installed correctly. When an UST is installed a notification form, available from each state, must be filled out. This form provides information about the UST, including a certification of correct installation. This form should be used to identify all existing UST's. Check with the regulatory authority about the particular reporting requirements in your area, including any additional or more stringent requirements.

5. Installation problems result from careless installation practices that do not follow standard industry codes and procedures. Improper installation is a significant cause of FRP and steel UST failures. All phases of tank storage, handling , installation and testing shall be discussed during the preparatory inspection meeting. Installation includes excavation, tank system siting, burial depth, tank system assembly, backfilling around the tank system and surface grading. Ensure the installer carefully follows the correct installation procedures called for by industry codes.

6. Questions and comments regarding this DCAF Bullentin may be directed to the Construction and Design Branch (CEMP-EC) at (202) 761-0205.

KISUK CHEUNG, P.E.
Chief, Engineering and Construction Division



NOTE:
IF STAND PIPE IS LONGER THAN
1FT., USE A 4" STAND PIPE WITH
BELL REDUCERS AS REQUIRED

FIGURE 1

074-1-18

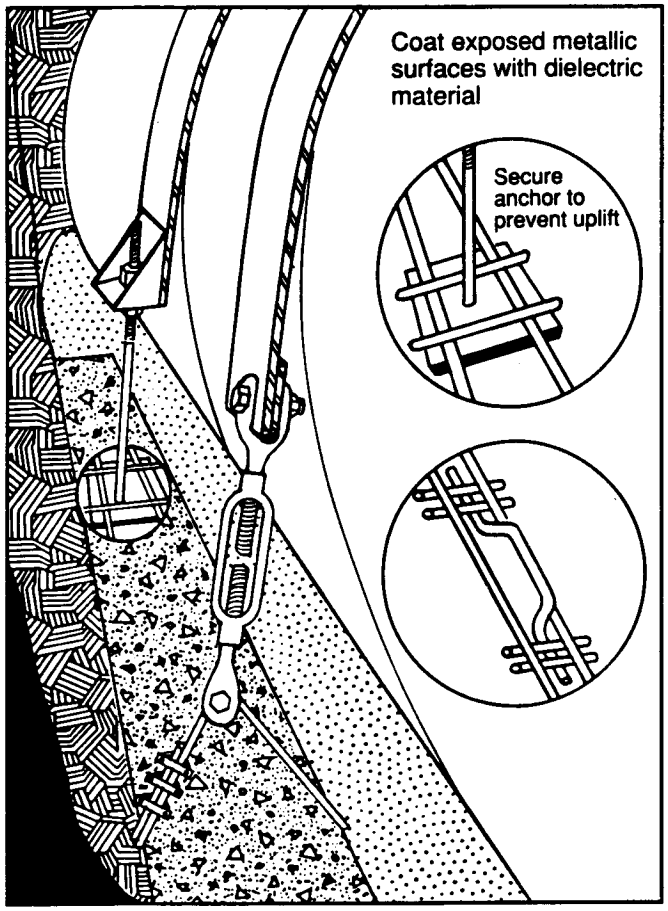


Figure 2 Methods of attachment. *Straps must be secured to prevent movement as the tank is filled and emptied during normal operations, or when groundwater causes upward forces. Over-tightening can damage the tank shell or coating.*

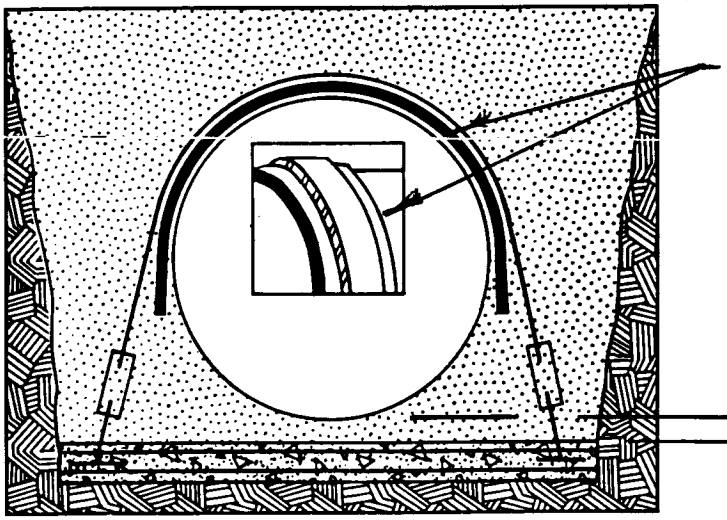


Figure 3 Bottom hold-down pad. *A reinforced bottom hold-down pad provides a firm bed for the tank and adds resistance to flotation. Insulating material separates straps from the tank.* ***TANKS SHOULD NEVER BE SET DIRECTLY ON A BOTTOM HOLD-DOWN PAD.***

Anode Integrity

sti-P3® tanks may be equipped with either zinc or magnesium anodes. Whereas magnesium anodes are designed only for installation in soil resistivities of 2000 ohms-cm or greater, zinc anodes are effective in all soil resistivities.

After an sti-P3® tank has been placed in the excavation, if anode is connected by a lead wire, attachment to the tank shall be checked to assure this connection has not been damaged. Where damaged, the connection must be reestablished in strict accordance with sti-P3® specifications.

To assure immediate operation of cathodic protection system, each anode shall be thoroughly saturated with water at time of backfill operation.

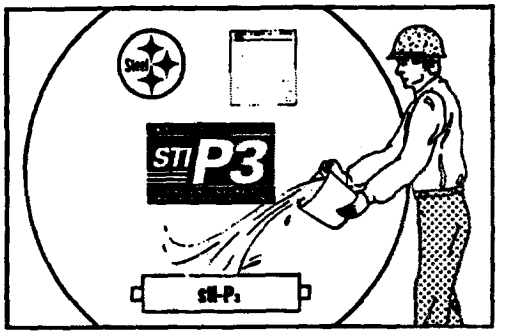


Figure 4

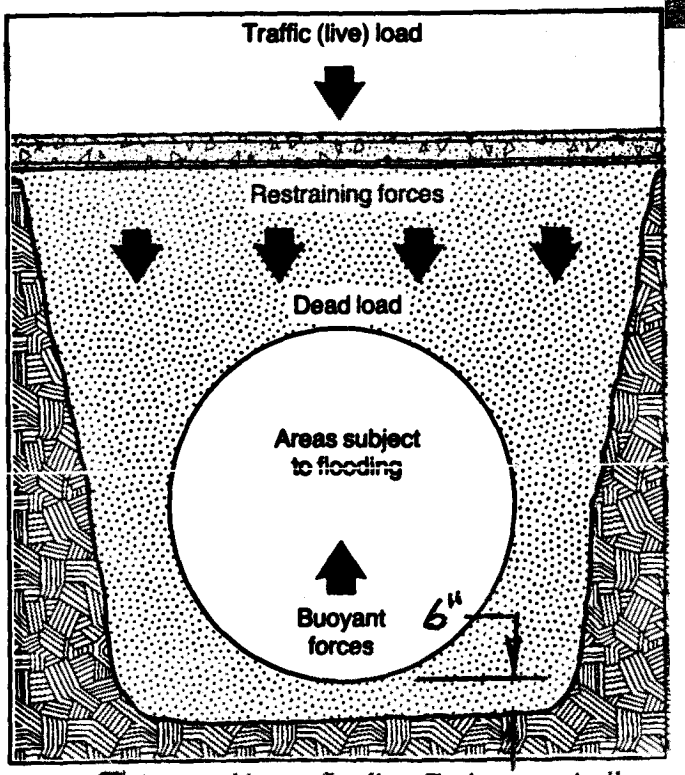


***Figure 5** Areas subject to flooding. Tanks are typically buried three to four feet below finished grade to provide adequate slope for piping and protection from traffic loads. Except in areas with high water tables, or areas subject to flooding, the weight of backfill and pavement over the tank is sufficient to offset buoyancy and prevent flotation.*

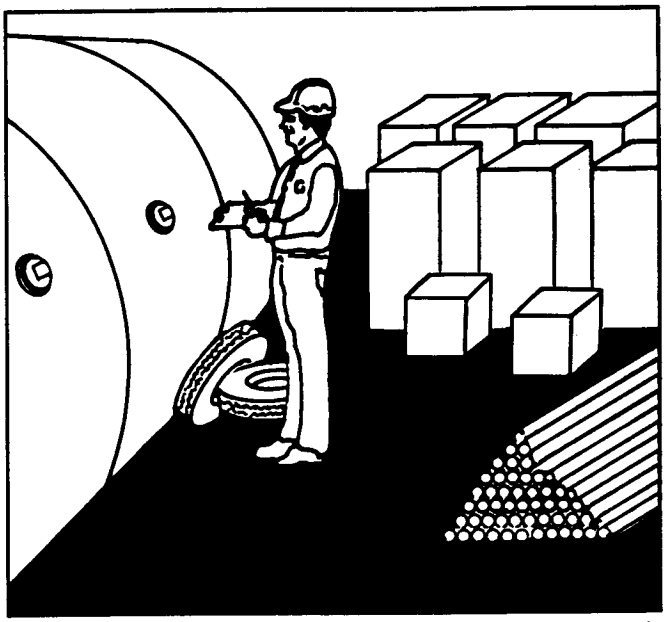


Figure 6 Preinstallation inspection. *All equipment, materials, and components must be inspected before installation. Noncompliance with the specifications or detected damage should be brought to the attention of the owner and repaired or replaced, as appropriate.*

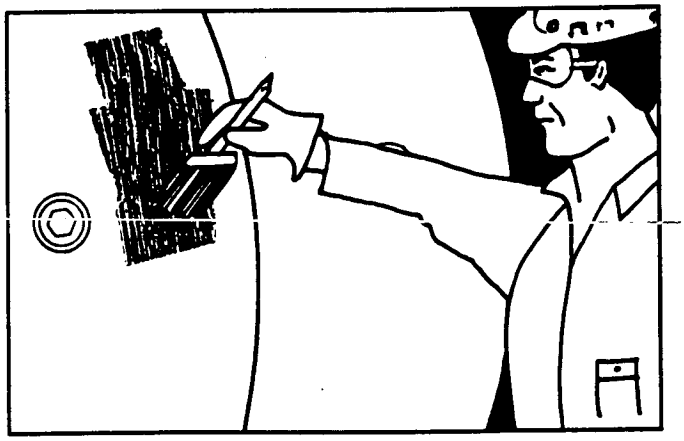


Figure 7 Field repairs. *Field repairs are permitted by some manufacturers, provided the person making the repairs has been trained and qualified and does the work in accordance with instructions of the manufacturer.*

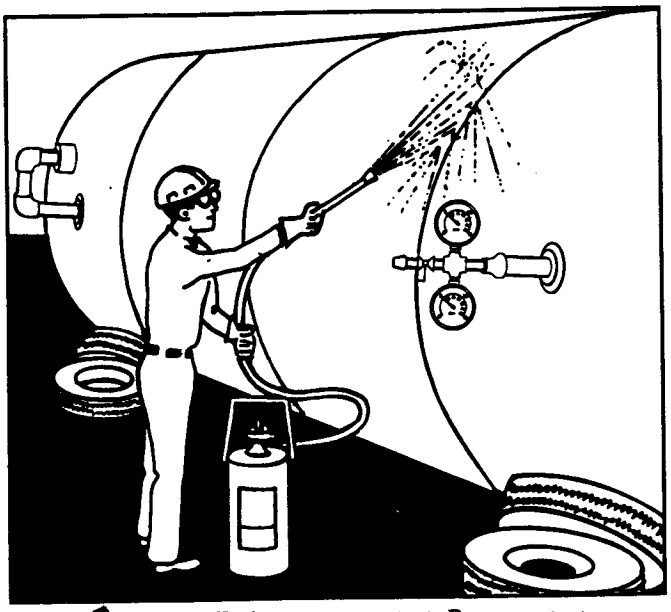


Figure 8 Preinstallation pressure test. *Pressure test conventional single-wall tanks at three to five psig. Soap all surfaces, seams, and fittings while carefully inspecting for bubbles.* ***NEVER TEST AT PRESSURES OVER FIVE PSIG.***

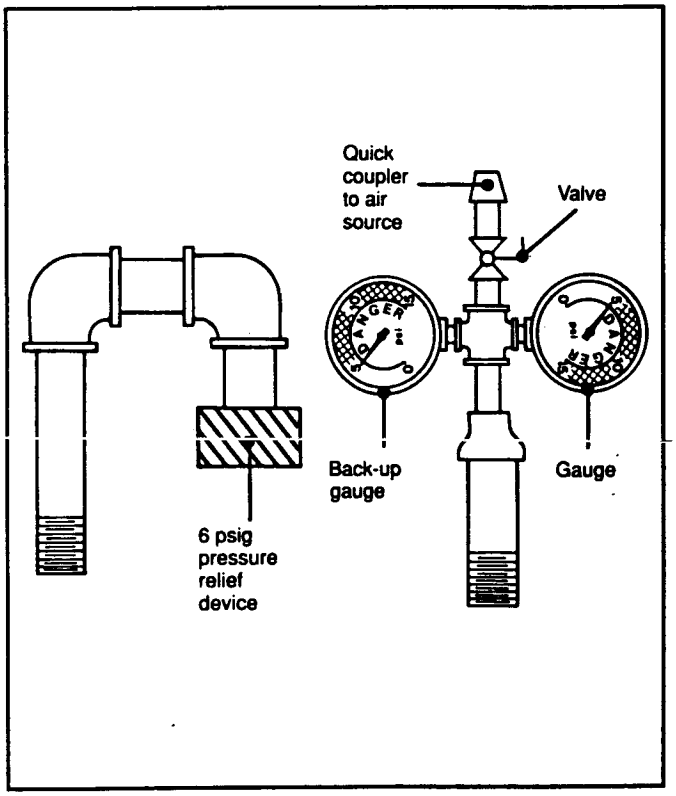


Figure 9 Gauge for air testing. *Selection and care of gauges used for air testing tanks are essential; gauges should have maximum limit of 10-15 psig.*

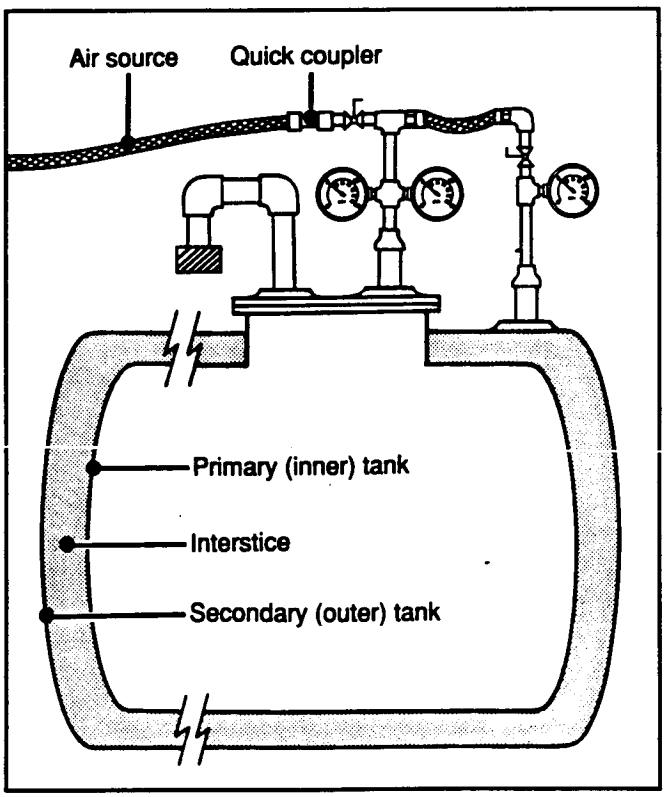


Figure 10 Air testing double-wall tanks. *Pressurizing the interstice with air pressure from the inner tank,* ***after disconnecting the outside air source****, prevents over-pressurization. The manifold illustrated is a useful method for accomplishing this.*

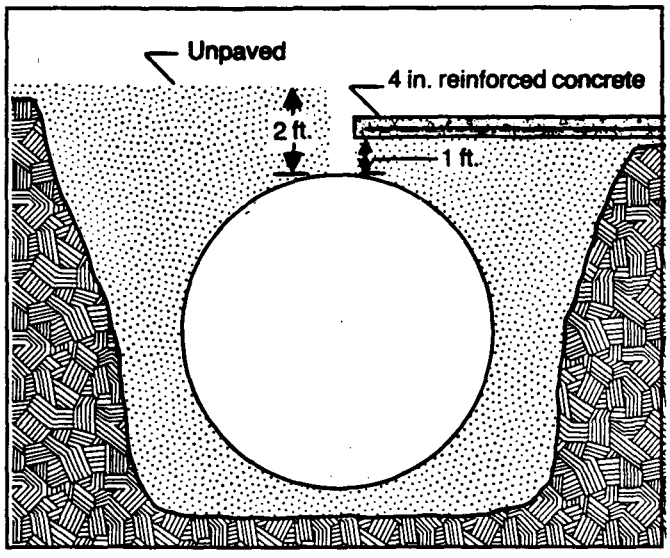


Figure 11. Depth of cover in dry areas not subject to traffic. *In dry areas, not subject to traffic, cover requirements may be reduced, but this reduced depth of cover may not prevent flotation if groundwater or surface water enters the excavation.*

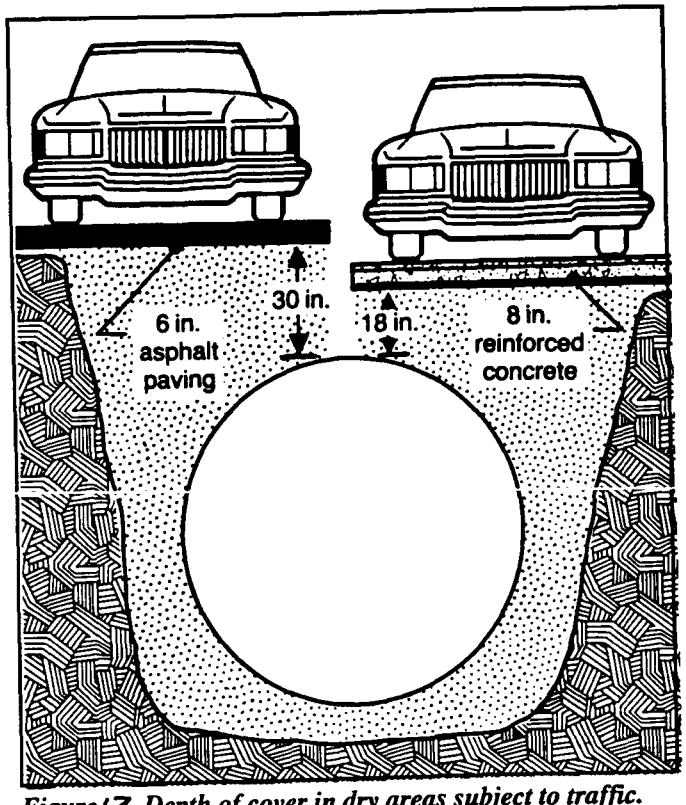


Figure 12. Depth of cover in dry areas subject to traffic. *The majority of tanks are located in areas subject to vehicle traffic. Backfill helps dissipate traffic loads and offset buoyancy. Flotation is not a consideration in dry areas.*

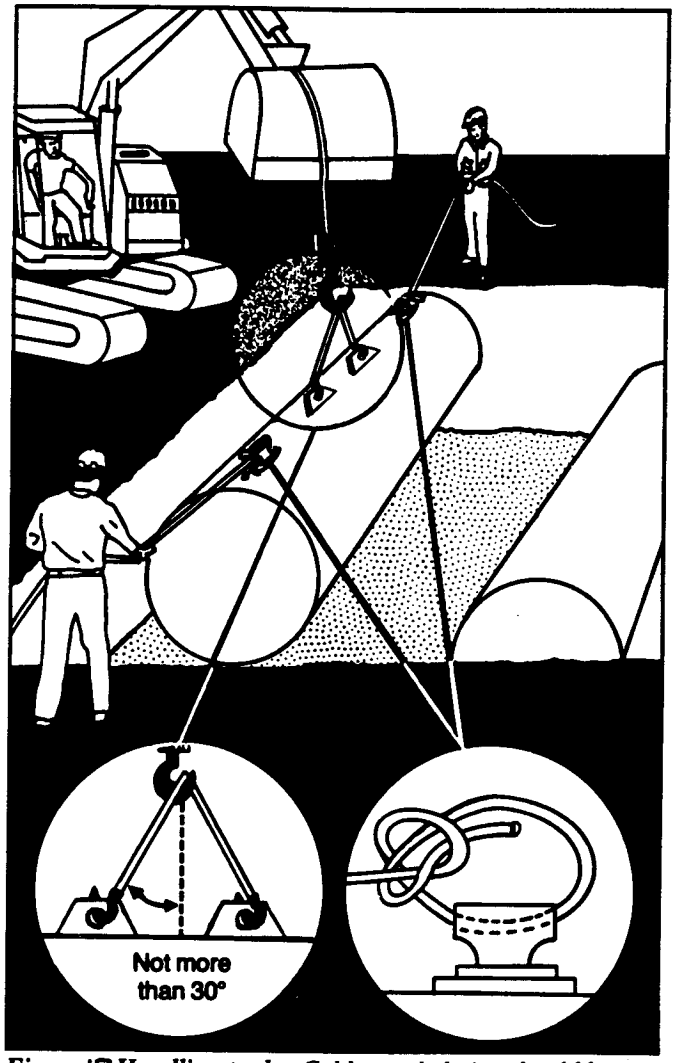


Figure 13 Handling tanks. *Cables and chains should be attached to lifting lugs, and guidelines should be used to control movement of the tank. Equipment used for handling tanks must have sufficient capacity to lift and lower the tank without dragging.* ***NEVER PLACE CHAINS OR CABLES AROUND THE SHELL OF THE TANK.***

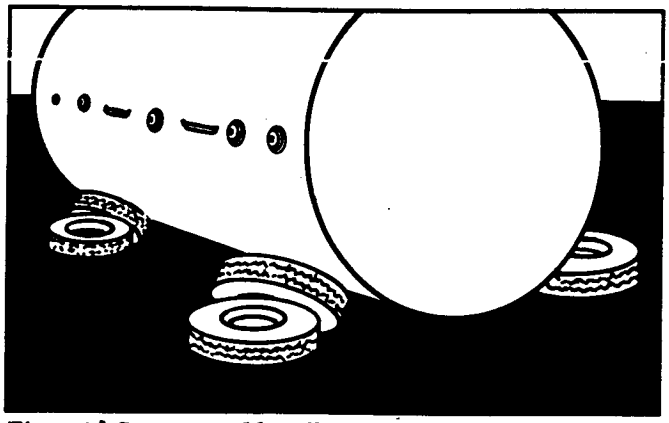


Figure 14 Storage and handling of tanks. *Good project management includes the assignment of storage areas to minimize relocation of tanks and equipment as work progresses. Tanks require protection from rolling, accidental contact damage, and vandalism.*

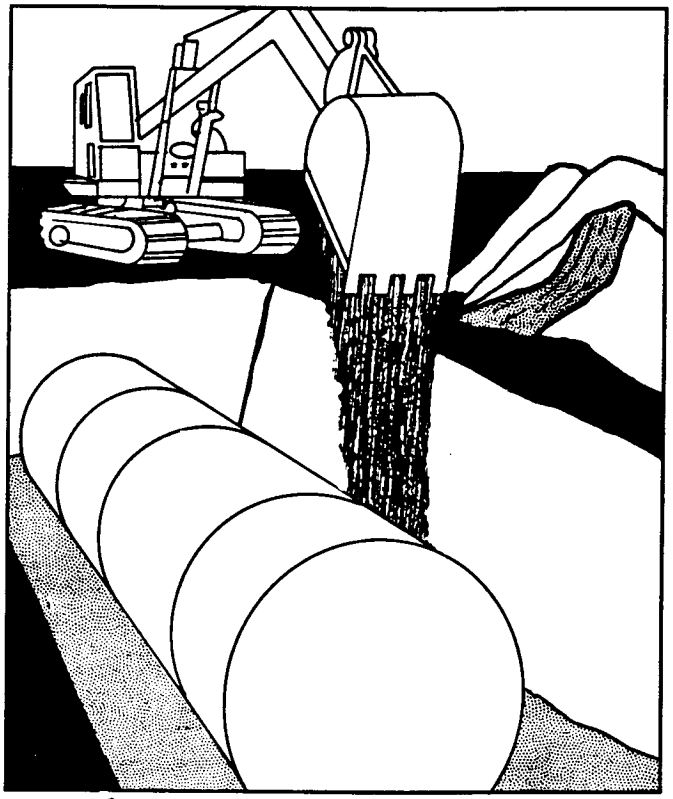


Figure 15. Backfilling. *Careful selection, placement and compaction of backfill material is essential to properly support and protect the tank and piping after installation.*

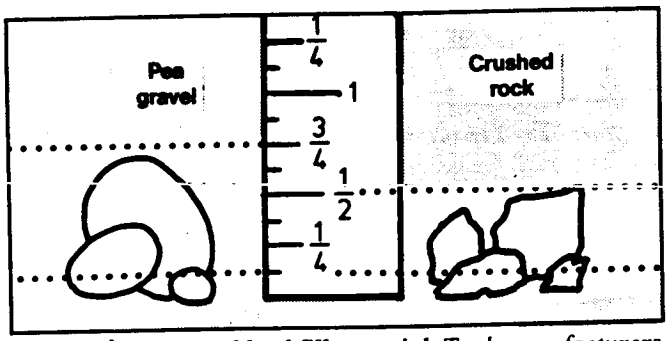


Figure 16. Approved backfill material. *Tank manufacturers have approved several types of backfill materials, including sand, pea gravel, and crushed rock. The latter two are relatively self-compacting, reducing the need for manual or mechanical compaction.*